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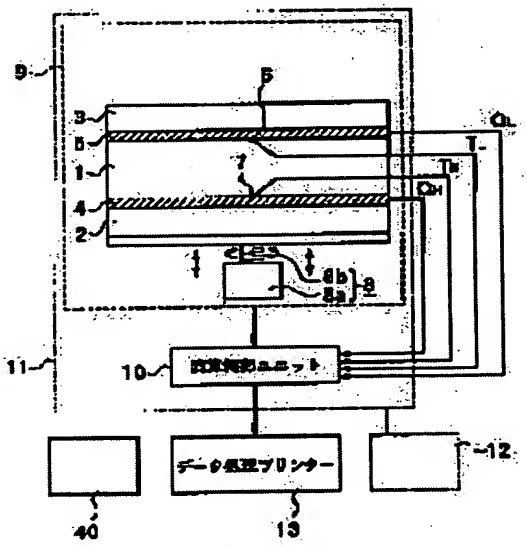
(54) METHOD AND APPARATUS FOR MEASUREMENT OF THERMAL CONDUCTIVITY OF FOAM SAMPLE

(57)Abstract:

PROBLEM TO BE SOLVED: To measure the thermal conductivity of a foam sample without generating dew condensation on a low-temperature-side hot plate even when the thermal conductivity of the foam sample in a low-temperature region corresponding to an actually used temperature is measured.

SOLUTION: In this method or this apparatus for the measurement of the thermal conductivity of the foam sample 1, a hot plate 2 and a hot plate 3 which are composed of a semiconductor temperature raising and cooling module are arranged on both faces of the foam sample 1, a heat flowmeter 4 and a heat flowmeter 5 as well as a thermocouple 6 and a thermocouple 7 are installed respectively on the surface and the reay surface of the foam sample 1. Temperatures on the respective faces are kept at a set temperature difference. The circumference of the foam sample 1 is kept at their average temperature. The thermal conductivity of the foam sample 1 is found according to a given principle expression. A measuring head 9 which contains the foam sample 1, the hot plate 2, 3 and the thermocouples 6, 7 or a measuring-apparatus body part is arranged and installed in a low-temperature thermostat 11, and the thermal conductivity of the foam sample 1 in a low-temperature region is measured.



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CLAIMS

[Claim(s)]
[Claim 1] While arranging the hot platen which changes from the temperature up cooling module of a semi-conductor to both sides of a foam sample Forming a heat flux meter and a temperature sensor in both sides of a foam sample, respectively, and maintaining the temperature of each field at a fixed temperature gradient, and maintaining the perimeter of a foam sample at the mean temperature In the thermal conductivity measuring method which asks for the thermal conductivity of the foam sample concerned according to a given principle type The thermal conductivity measuring method of the foam sample characterized by arranging the measuring head or the body part of a measuring device containing said foam sample, a hot platen, and a temperature sensor in a low-temperature thermostatic chamber, and measuring the thermal conductivity of a low-temperature region.
[Claim 2] Arrange the hot platen which changes from the temperature up cooling module of a semi-conductor to both sides of a foam sample, use one of these as an elevated-temperature side hot platen, use another side as a low temperature side hot platen, and the heat flux meter and temperature sensor which have known heat flow rate sensibility in this elevated-temperature side hot platen and a low temperature side hot platen are embedded. In the thermal conductivity measuring apparatus which asks for the thermal conductivity of the foam sample concerned according to a given principle type while maintaining the temperature of each field at a fixed temperature gradient and maintaining the perimeter of a foam sample at the mean temperature Thermal conductivity measuring apparatus of the foam sample characterized by arranging the measuring head or the body part of a measuring device containing said foam sample, a hot platen, and a temperature sensor in the thermostatic chamber of the low temperature divided with the exterior by the heat insulation panel.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the thermal conductivity measuring method and measuring device suitable for measuring the thermal conductivity of a foam sample, especially the thermal conductivity of a foam sample with low thermal conductivity like the urethane foam used for the heat insulator wall of a refrigerator.
[0002]
[Description of the Prior Art] While arranging the temperature up cooling module of a semi-conductor to foam sample both sides, using one of these as an elevated-temperature side hot platen as thermal conductimetry equipment of a heat insulator like this kind of urethane foam and using another side as a low temperature side hot platen conventionally The thermal conductivity measuring apparatus which asks for the thermal conductivity of the foam sample concerned according to a given principle type is known forming a heat flux meter and a temperature sensor in both sides of a foam sample, respectively, and maintaining the temperature of each field at a fixed temperature gradient, and maintaining the perimeter of a foam sample at the mean temperature.
[0003] Since this measuring device may dew when it is used in a location with much humidity etc., it is used carrying out a temperature up to ordinary temperature or about 410 degrees C, when it is had and dewed, opening a front door, and making it dry completely. Moreover, when disliking dew condensation, a gas inlet is established in an equipment rear face, and a certain dry gas (for example, air, N2 grade) is used from this gas inlet, putting in. That is, Rhine of the air purge which blows desiccation gases (air etc.) is also attached to equipment.
[0004]
[Problem(s) to be Solved by the Invention] However, when an experimental object is foam as a heat insulator used for adiabatic walls, such as a prefab refrigeration refrigerator, the temperature up of the thermal conductimetry will be carried out to ordinary temperature or such about 410 degrees C, or the value in the condition of having been widely different from measurement of the heat insulator in an actual busy condition will be measured in carrying out by putting in a dry gas.
[0005] Then, although to measure thermal conductivity in the low-temperature region corresponding to the temperature usually used was desired, when this invention person etc. measured thermal conductivity in the low-temperature region concerned, it turned out that dew condensation arises in a low temperature side hot platen, that trouble starts a maintenance for this reason, and that exact data are not obtained. namely, -- as [this] -- foam -- a sample -- foam -- ordinary temperature -- or it is made to dry and measures -- it must be based on that approach.
[0006] Therefore, further, according to that the thermal conductimetry data of the low-temperature region which reflected correctly the condition that the foam sample was used as a panel of adiabatic walls, such as a refrigerated warehouse, are obtained, and as actual in the measurable range a service condition as possible, a large (low temperature side 0-degree-C or less side, an elevated-temperature side 30 degrees C) temperature requirement is taken, and to enable it to grasp the relation of the temperature

and the heat conductivity in various foam is desired at the measuring device concerned.
[0007] This invention was made in view of the above-mentioned situation, and also aims measurement of the thermal conductivity in the low-temperature region corresponding to the temperature actually used a low temperature side hot platen at offering the thermal conductivity measuring method and measuring device of a foam sample which dew condensation does not produce.
[0008]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is constituted as follows.
[0009] (1) While a measuring method according to claim 1 arranges the hot platen which changes from the temperature up cooling module of a semi-conductor to both sides of a foam sample Forming a heat flux meter and a temperature sensor in both sides of a foam sample, respectively, and maintaining the temperature of each field at a fixed temperature gradient, and maintaining the perimeter of a foam sample at the mean temperature In the thermal conductivity measuring method which asks for the thermal conductivity of the foam sample concerned according to a given principle type, the measuring head or the body part of a measuring device containing said foam sample, a hot platen, and a temperature sensor is arranged in a low-temperature thermostatic chamber, and it is characterized by measuring the thermal conductivity of a low-temperature region.
[0010] (2) Thermal conductimetry equipment according to claim 2 arranges the hot platen which changes from the temperature up cooling module of a semi-conductor to both sides of a foam sample. Use one of these as an elevated-temperature side hot platen, use another side as a low temperature side hot platen, and the heat flux meter and temperature sensor which have known heat flow rate sensibility in this elevated-temperature side hot platen and a low temperature side hot platen are embedded. In the thermal conductivity measuring apparatus which asks for the thermal conductivity of the foam sample concerned according to a given principle type while maintaining the temperature of each field at a fixed temperature gradient and maintaining the perimeter of a foam sample at the mean temperature It is characterized by arranging the measuring head or the body part of a measuring device containing said foam sample, a hot platen, and a temperature sensor in the thermostatic chamber of the low temperature divided with the exterior by the heat insulation panel.
[0011] According to the above-mentioned approach and the equipment of this invention, the measuring head or the body part of a measuring device containing a foam sample, a hot platen, and a temperature sensor Since it arranges in the thermostatic chamber of the low temperature corresponding to the temperature actually used and is made to measure the thermal conductivity of a low-temperature region The thermal conductivity of a foam sample can be measured in the condition that dew condensation does not produce measurement of the thermal conductivity of the low-temperature region of the heat insulator in an actual busy condition (for example, a low temperature side 0-degree-C or less side, an elevated-temperature side 30 degrees C) in a low temperature side hot platen, either.
[0012] Moreover, since dew condensation does not arise in a low temperature side hot platen, when dew condensation arises conventionally, the desiccation process of required equipment can be abolished. Therefore, trouble does not start the maintenance of equipment.
[0013] Moreover, since dew condensation does not arise in a low temperature side hot platen, the thermal conductimetry data of the exact low-temperature region which reflected correctly the condition that the foam sample was used as a panel of adiabatic walls, such as a refrigerated warehouse, can be obtained. Therefore, the relation of the temperature and the thermal conductivity in various foam can be grasped exactly.
[0014]
[Embodiment of the Invention] The operation gestalt of this invention is explained at a detail based on a drawing below.
[0015] First, the configuration of the whole refrigerated warehouse which consists of heat insulation panels possessing the foam which it is going to measure with the thermal conductivity measuring method and measuring device of this invention is shown in drawing 3 . between the metal faceplates of the pair which a refrigerated warehouse 21 is a small refrigerated warehouse of for example, a prefab

type in drawing, and is a measuring object object in this invention -- for example, adiathermic [, such as foaming polyurethane,] -- it is constituted using the adiathermic floor panel 22 filled up with the core, the outer wall panel 23, and the roof panel 24. That is, on the floor panel 22, the outer wall panel 23 is set up so that a four way type may be surrounded, the roof panel 24 is attached on this outer wall panel 23, warehouse room 21a is constituted by the cube type which the rectangle sealed, and the entrance 27 which equipped the side attachment wall 25 by the outer wall panel 23 with the door 26 is formed. 28 is head lining by the roof panel 24. And it is equipped with the cooling system 30 which used the cross duct for this refrigerated warehouse 21.

[0016] A cooling system 30 consists of an indoor unit 36 and an outdoor unit 37 with a conventional method, and it has the unit cross duct unit which connected one cross duct 32 with the condensator which cools the recirculating air inhaled by suction fan 35a which can take a static pressure, and an indoor unit 36 hangs the cross duct 32 of this unit, and supports and consists of means.

[0017] Next, the thermal conductivity measuring method and measuring device concerning this invention are explained with reference to drawing 1 and drawing 2 .

[0018] In drawing 1 , a sign 1 is a foam sample and consists of the urethane foam as a heat insulator. The magnitude is 200mmx200mmx30mm(t). The hot platens 2 and 3 which change from the temperature up cooling module of the semi-conductor using a Peltier effect to the field of the upper and lower sides of this foam sample 1 are arranged, one of these is used as the elevated-temperature side hot platen 2, and another side is used as the low temperature side hot platen 3. Moreover, the heat flux meters 4 and 5 which have known heat flow rate sensibility, and the thermocouples 6 and 7 as a temperature sensor are embedded at this elevated-temperature side hot platen 2 and the low temperature side hot platen 3.

[0019] The water cooled jacket (not shown) which pours the cooling water from a tank is prepared in the outside of the hot platens 2 and 3 which consist of the temperature up cooling module of the above-mentioned semi-conductor as a heat sink. The temperature up cooling system which can change the temperature gradient of the vertical side of the foam sample 1 is constituted by this water-cooled heat sink and the semi-conductor thermostat joule of the above-mentioned hot platens 2 and 3. The capacity of equipment changes with the water temperature and temperature stability of cooling water to a semi-conductor thermostat joule in this temperature up cooling system. That is, laying temperature is restricted by water temperature.

[0020] In addition, in drawing 1 , a sign 8 is a thickness measuring machine style, for example, it is structure with possible consisting of stepping motor 8a, ball-thread device 8b, etc., bringing the elevated-temperature side hot platen 2 close to the low temperature side hot platen 3, and making the foam sample 1 contact, and distance until it contacts the foam sample 1 from the criteria location is measured as thickness [of the foam sample 1] L.

[0021] The measuring head 9 is constituted including the above foam sample 1, hot platens 2 and 3, and thermocouples 6 and 7.

[0022] In the case of the measuring device shown in this operation gestalt, the measuring head 9 and the operation control unit 10 are unifying, and this body part of a measuring device, i.e., measuring head, and operation control unit 10 are put in in the thermostatic chamber 11 (a thermostat 11 is told to below) which consists of the cryostat by which the temperature shown by the alternate long and short dash line frame was stabilized.

[0023] The operation control unit 10 within the body 11 of a measuring device contains the microprocessor, it performs a measurement setup from a keyboard and a temperature setup of a maximum of nine points has come to be able to do it. 13 is the data-processing printer connected to the operation control unit 10, and prints out the measurement result of thermal conductivity.

[0024] the above-mentioned thermostat 11 is shown in drawing 2 -- as -- between faceplate 14a of a pair -- adiathermic -- heat insulation of a core, for example, foaming polyurethane etc., -- a core -- while being divided with the exterior by head lining 15, the side attachment wall 16, and the floor 17 which are formed by the heat insulation panel 14 filled up with 14b, a part of side face is equipped with the door 18 formed in adiathermic transparence members, such as glass, possible [closing motion], and

partition formation is carried out with the exterior. moreover -- the upper part of the side attachment wall 16 of a thermostat 11 -- constant temperature -- fluid inlet 16a prepares -- having -- **** -- this constant temperature -- fluid inlet 16a and the cooling system 40 by the refrigerating cycle installed outside are connected through the duct 41. in addition, constant temperature -- a fan 42 equips fluid 16a -- having -- **** -- this fan 42 -- the constant temperature of predetermined temperature -- it is constituted so that a fluid, i.e., air, may be supplied in a thermostat 11.

[0025] Thus, in the thermostat 11 constituted, the installation table 43 is arranged, on this installation table 43, a measuring head 9 and the operation control unit 10 can be laid, the data-processing printer 13 and a monitor (not shown) can be arranged to the exterior of a thermostat 11, and the thermal conductivity of the foam sample 1 can be measured.

[0026] In addition, in the above-mentioned explanation, although the thermostat 11 explained the case where the cooling system by the refrigerating cycle was provided, as a two-dot chain line shows, it is good for drawing 1 also as structure equipped with the cooling system by the water cooled jacket (not shown) which pours the cooling water from a constant temperature bath 12 .

[0027] A measurement principle is a heat-flux-meter method (JIS A1412, ASM C518, ISO8301), it measures using the heat flux meter proofread beforehand so that the heat flow consistency which passes a sample can be converted into electromotive force, and it asks for thermal conductivity by measuring the temperature gradient of the data upper and lower sides at that time.

[0028] As described above, the heat flux meters 4 and 5 and the thermocouples 6 and 7 for thermometries which have known heat flow rate sensibility are embedded at hot platens 2 and 3. According to the following principle type (1), the thermal conductivity of the foam sample 1 concerned is measured, setting the foam sample 1, and maintaining the temperature of each top face of these hot platens 2 and 3, and an inferior surface of tongue at a fixed temperature gradient, and maintaining the perimeter of the foam sample 1 at that mean temperature between this elevated-temperature side hot platen 2 and the low temperature side hot platen 3. In that case, the body part of a measuring device which consists of a measuring head 9 and the operation control unit 10 is put into a thermostat 11, and is made into the low temperature which stabilized the ambient temperature of the foam sample 1 with the thermostat 11.

[0029] It can ask for the thermal conductivity lambda of the foam sample 1 by the following (1) type from temperature-gradient deltaT (deltaT=TH-TL) of the foam sample 1, the density of heat flow rate QH and QL of a vertical side, and the temperature TH and TL of both sides of a sample, and thickness L of a sample.

[0030]

lambda= [(QH+QL) /2] - [L/deltaT] -- (1)

The thermal conductivity of 0.005-0.8 W/mk (12 or less W/mk of however, thermal conductance) and temperature is adjustable among 5-75 degrees C in 3 - 20 degrees C - 50 degrees C (top-face plate) of low temperature side hot platens, and the elevated-temperature side hot platen (inferior-surface-of-tongue plate) 2, and, as for measuring range, a measurement temperature requirement suits like a prefab refrigeration refrigerator panel also about what has the important value of the thermal conductivity in a low-temperature region.

[0031] This equipment measures by checking after a start that it will have been in the steady state by the comparison of the value of the up-and-down heat flux meters 4 and 5. This means that actuation can measure by being simple in a short time.

[0032] This artificer etc. examined how to put in and measure a test section (body part of a measuring device containing a measuring head 9 or this) in the low-temperature thermostat 11. Here, the case where made into the example of an operation gestalt of this invention the case where a test section was installed in the 5-degree C thermostat 11, and a test section was installed in the 23**2-degree C interior of a room was made into the conventional example of a comparison, and the effect which the generating situation of dew condensation of a test section and dew condensation have on thermal conductivity, respectively was investigated.

[0033] The measurement mean temperature at the time of measurement considered as two levels (-5

degrees C and 0 degree C) (from -5 degrees C to measurement), and made the temperature gradient of the vertical hot platens 2 and 3 30 degrees C. Measurement was performed from the conditions which installed the test section in the 5-degree C thermostat 11, and after measurement termination of an affair mentioned in the preceding article, 23**2-degree C conditions were performed, after holding more than for about 30 minutes to the interior of a room adjusted to 23**2 degrees C.

[0034] Here, the measurement mean temperature is the minimum average measurement temperature which can be measured using the temperature which can set up the vertical hot platens 2 and 3, for example, when top hot-platen temperature is made into -20.0 degrees C and whenever [defervescence board temperature] is set as 10.0 degrees C (30 degrees C of vertical hot-platen temperature gradients), the measurement mean temperature is calculated as one half of the sum of both hot-platens temperature, and becomes -5 degrees C. As a case of conditions where -5 degrees C of measurement mean temperature are obtained when a vertical hot-platen temperature gradient is 30 degrees C Although it may be 15.0 degrees C and 45.0 degrees C when setup of whenever [in above-mentioned / others and upper hot-platen temperature and defervescence board temperature] is -20.0 degrees C and 10.0 degrees C, it is -15.0 degrees C and 15.0 degrees C, and it is -5.0 degrees C and 25.0 degrees C, and it is 5.0 degrees C and 35.0 degrees C Here, it brought close to the service temperature of the target refrigerated warehouse, and considered as -5 degrees C of measurement mean temperature using the case where it is set as 10.0 degrees C whenever [upper hot-platen temperature / of -20.0 degrees C /, and defervescence board temperature]. It is also the same as when obtaining 0 degree C of measurement mean temperature.

[0035] Next, although the vertical hot-platen temperature gradient was made into 30 degrees C, this is based on the following reason. That is, when it sees with the service temperature of a real panel, the minimum temperature in a warehouse is -5 degrees C (if panel thickness becomes large, the minimum temperature in a warehouse will become low) in 42mm in panel thickness, and if temperature outside a warehouse is made into 30 degrees C, it will become a 35-degree C temperature gradient. Since this temperature gradient became so large that panel thickness becomes large, took [that it will be / direction / good] as large a measurement temperature gradient as possible. Therefore, the standard vertical hot-platen temperature gradient was made into 30 degrees C.

[0036] In addition, if the urethane foam of the foam sample 1 is managed in the condition that form is unreserved, thermal conductivity will rise gradually. This is because foaming agent gas vaporizes in air and is permuted by air. Then, it was kept in the state of the panel covered by facing and frame material until just before producing a test portion, and the cutting plane stuck the aluminum foil tape so that there might be no unreserved section of form. Production of a test portion was cut in the dimension predetermined by the band saw, and was provisionally kept in the 23**2-degree C thermostatic chamber on the 1st. Although it is desirable to measure measurement immediately after sample production originally as for this, thermal conductivity is from the reasons of changing gradually, a dimension not being stabilized immediately after sample production also in test portion production and measurement (it takes 2 to 3 hours).

[0037] The measurement result of thermal conductivity is shown in Table 1.

[0038]

[Table 1]

	比較例		本発明	
雰囲気温度(℃)	23±2		5	
測定平均温度(℃)	−5	0	−5	0
熱伝導率 ※	0.0191(0.0164)	0.0194(0.0167)	0.0190(0.0163)	0.0193(0.0166)
結露	有り		無し	

※単位:w/mk(kcal/mh℃)

As shown in Table 1, in observation of the test section after measurement, dew condensation arises at the 23**2-degree C ambient temperature of the example of a comparison. On the other hand, when it

measured within the thermostat 11 of the 5-degree C ambient atmosphere of this invention, it checked that dew condensation did not arise. Moreover, the example of a comparison, and in the case of this invention, difference is accepted also in the thermal conductivity value of a measurement result.
[0039] That is, measurement of the thermal conductivity of the low-temperature region (-5 degrees C of measurement mean temperature, 0 degree C) of the heat insulator in 10 degrees C can also measure the thermal conductivity of the foam sample 1 a -20-degree-C and elevated-temperature side the low temperature side near an actual busy condition in the condition of not making the low temperature side hot platen 3 producing dew condensation. Moreover, since dew condensation does not arise in the low temperature side hot platen 3, when dew condensation arises conventionally, the desiccation process of required equipment can be abolished. Therefore, trouble does not start the maintenance of equipment. Moreover, since dew condensation does not arise in the low temperature side hot platen 3, the thermal conductimetry data of the exact low-temperature region which reflected correctly the condition that the foam sample 1 was used as a panel of adiabatic walls, such as a refrigerated warehouse, can be obtained.

[0040] While arranging the hot platens 2 and 3 which change from the temperature up cooling module of a semi-conductor to both sides of a foam sample with the above-mentioned operation gestalt Forming heat flux meters 4 and 5 and the thermocouples 6 and 7 as a temperature sensor in the top face and inferior surface of tongue of the foam sample 1, respectively, and maintaining the temperature of each top face and an inferior surface of tongue at a fixed temperature gradient, and maintaining the perimeter of the foam sample 1 at the mean temperature In the thermal conductivity measuring method which asks for the thermal conductivity of the foam sample 1 concerned according to a given principle type, the measuring head 9 or body of measuring device 11 part containing the above-mentioned foam sample 1, hot platens 2 and 3, and a temperature sensor was arranged into the thermostat 11, and the gestalt which measures the thermal conductivity of a low-temperature region was explained.
[0041] However, this invention is not limited to this gestalt. For example, as thermal conductivity measuring apparatus of this kind of foam, a thin line heater and a thermocouple are inserted between the foam samples of 2 rates which consist of foam, the temperature in a foam sample over the time amount when impressing fixed power to a heater is measured, and it goes, since the temperature at this time is proportional to the logarithm of time amount, the so-called heat ray method thermal conductivity measuring apparatus which asks for thermal conductivity is known, and it can apply also to such thermal conductimetry.
[0042] Moreover, although the above-mentioned operation gestalt explained the case where the foam sample 1 was arranged horizontally, the arrangement gestalt of the foam sample 1 may be arranged perpendicularly arbitrarily.
[0043] Moreover, by arranging a heating element and continuing supplying fixed power into a foam sample (foaming resin), at this, the temperature rise process of the heating element at the time of the Joule's heat to generate conducting in a foam sample is measure with a temperature sensor, the thermal conductivity measuring method which asks for the thermal conductivity of the foam sample concerned by analyzing this according to a given principle type is also know, and it can apply also to the thermal conductimetry of such an approach.
[0044]
[Effect of the Invention] Since according to the thermal conductivity measuring method and measuring device of a foam sample of this invention the measuring head or the body part of a measuring device containing a foam sample, a hot platen, and a temperature sensor is arranged in a low-temperature thermostatic chamber and it is made to measure the thermal conductivity of a low-temperature region as explained above, the following outstanding effectiveness is acquired.
[0045] The thermal conductimetry of the heat insulator of a low-temperature region near an actual busy condition or this actual can also measure the thermal conductivity of a foam sample in the condition of not making a low temperature side hot platen producing dew condensation.
[0046] Moreover, since dew condensation does not arise in a low temperature side hot platen, when dew condensation arises conventionally, the desiccation process of required equipment can be abolished.

Therefore, trouble does not start the maintenance of equipment.
[0047] Moreover, since dew condensation does not arise in a low temperature side hot platen, the thermal conductimetry data of the exact low-temperature region which reflected correctly the condition that the foam sample was used as a panel of adiabatic walls, such as a refrigerated warehouse, can be obtained. Therefore, the relation of the temperature and the thermal conductivity in various foam can be grasped exactly.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram of the thermal conductivity measuring apparatus concerning this invention.
[Drawing 2] It is the outline sectional view of the above-mentioned thermal conductivity measuring apparatus.
[Drawing 3] It is the perspective view showing the configuration of the whole refrigerated warehouse using the foam concerning the measuring object of the thermal conductivity of this invention.
[Description of Notations]
1 Foam Sample
2 Elevated-Temperature Side Hot Platen
3 Low Temperature Side Hot Platen
4 Five Heat flux meter
6 Seven Thermocouple
8 Thickness Measuring Machine Style
9 Measuring Head
10 Operation Control Unit
11 Thermostat (Thermostatic Chamber)
12 Constant Temperature Bath
13 Data-Processing Printer
14 Heat Insulation Panel

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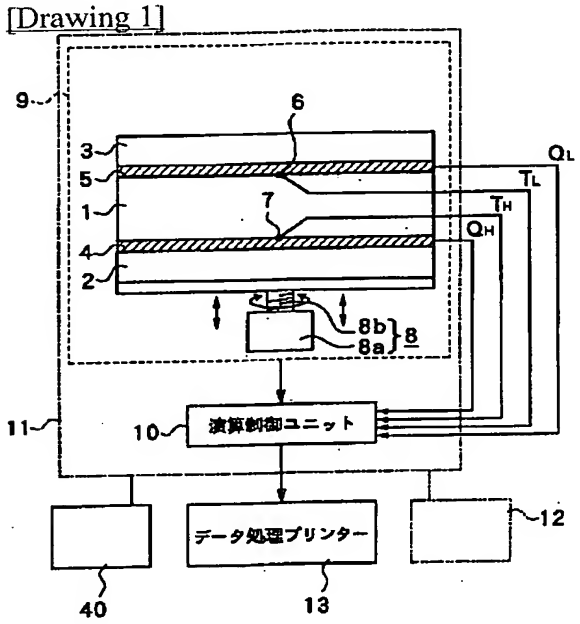
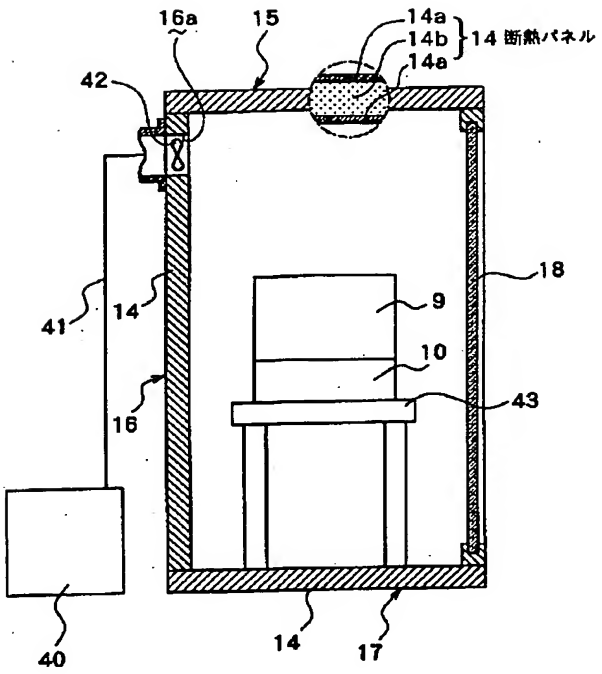
DRAWINGS

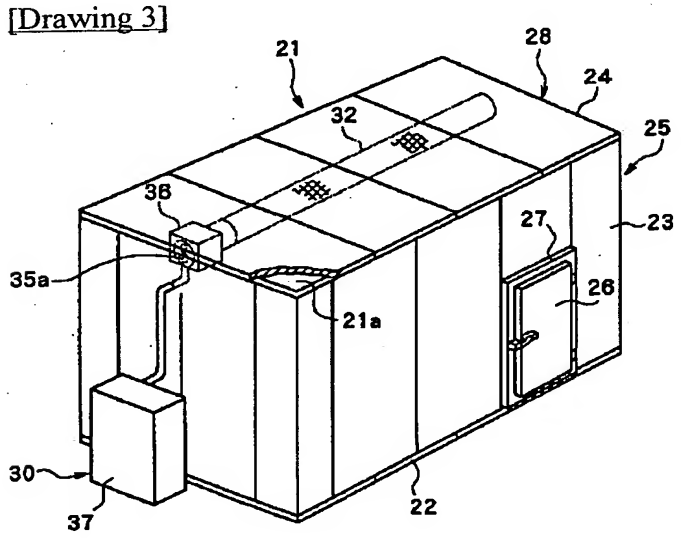
[Drawing 1]



[Drawing 2]



[Drawing 3]



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